OBSERVATIONS ON THE CHÆTOTAXY OF CALLIPHORINAE.*

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LUCILIA.

In his "Synopsis of the Calliphorinæ (Diptera) of the United States" (Zool. Bull. 1899, Vol. 11, No. 6), Garry de Neuville Hough defines our species of Lucilia as follows:

"Two postacrosticals. Front of male linear, of female one-third as wide as the head; abdomen unicolorous. *cæsar* L.

"Front of male not linear, at narrowest part about one-eighth as wide as the head; front of female about one-fourth as wide as the head; abdomen not unicolorous, first segment and hind margins of second and third blackish, contrasting strongly with the remainder *pilatei* nov. sp. [Hough]

"Three postacrostalis. Palpi black; front of male very narrow, that of female about one-third as wide as the head; abdomen with two stout marginal macrochætæ on the second abdominal segment. *sylvarum* Meig.

"Palpi yellow; front of male varies from one-eighth to one-sixth as wide as the head, that of female about one-third as wide as the head; second abdominal segment without marginal macrochætæ. *sericata* Meig."

Moreover, he says, "The chætotaxy is invariable for each species except for an occasional evident deformity, and it differs in the different species only in the number of achrostical bristles."

Observations were made on this subfamily during the past season and especial attention was given to the matter of chætotaxy in Lucilia. Thus some estimate may be obtained of the extent of deformity as it occurs in nature. Female flies of this genus, moreover, were obtained alive and set in cages containing fish, in order that their offspring might be obtained for the purpose of studying the range of variation in the progeny of the separate females. Each family probably represents the offspring of several males as copulation is frequent. The bristles studied comprise only the achrosticals and the dorsocentrals posterior to the transverse suture of the thorax, with the exception that in *L. sylvarum* the marginal bristles on the second abdominal segment were recorded as they showed considerable divergence from the normal condition recorded by Hough and are regarded as a specific character.

*Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 67.

The post-sutural dorso-centrals and achrosticals in *L. sericata* form a group of twelve in four rows of three each as shown in the diagram (Fig. 1). This arrangement is recorded as 3, 3, 3, 3, the separation into rows being denoted by commas.

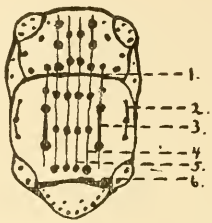

Fig. 1. Thorax of *Calliphora viridescens* to show typical arrangement of post sutural bristles. 1. Transverse suture. 2. Supra-alar bristles. 3. Intra-alar bristles. 4. Dorso-central bristles. 5. Post acrostical bristles. 6. Scutellar suture.

When one or two of the anterior bristles of a row are omitted, the row is denoted by 2 or 1 respectively.

In order to denote the omission of the second or third bristle when those anterior to it are not omitted, the normal positions of the bristles are recorded as a, b, and c, from anterior to posterior. Thus a row lacking the second bristle would be called ac.

Addition of a supernumerary bristle into a row is denoted by ! inserted in the proper position between or in front of the letters denoting the normal bristles. Thus addition of a bristle in front of a row would be expressed by calling the row !abc. But in some cases the number of bristles alone was recorded for each row and the row was called 4 or 5, according to whether one or two bristles were added.

Insertion of a supernumerary bristle between the normal rows is denoted by parentheses enclosing a, b, or c, according to the position of the bristle from anterior to posterior. Thus a definition as 3, (a), 3, 3, 3, would denote the addition of a bristle between the first left post-dorso-central and the first left post-achrostical.

Additional bristles are usually smaller than the normal, but range all the way from microchaetæ to the size of the normal macrochaetæ. A small bristle is denoted by italics.

The records of wild flies are first noted, and these are followed by an account of the breeding experiments.

On July 29 the following were taken at meat near the Bussey Institution, Forest Hills, Mass.

L. sericata: 277 individuals—3, 3, 3, 3. 1 ♂ —3, 3, ab, 3.
1 ♀ —5, 3, 3, 4. 1 ♀ —3, 2, 2, 4.
4 ♀♀—3, 2, 2, 3. 2 ♀♀—3, 3, 2,3 .
2 ♀♀—3, 3, 3, 4. 1 ♀ —3, 4, 3, 3.
1 ♀ —3, 3, 4, 3. 1 ♂ —3, 2, 3, 3.

The frequent lack of anterior post-achrosticals either on one or on both sides is interesting as it denotes approach toward L. caesar. The general habitus, however, is typical sericata. A single specimen of caesar taken in this lot was 3, *a*bc, *a*bc, 3. Thus it appears that chaetotaxy alone cannot be relied upon to determine the species with certainty. This will appear from the following observations and even more clearly from the breeding experiments.

On Aug. 5, at meat at Bussey Institution, were taken:

L. sericata: 311 indidivuals—3, 3, 3, 3. 1 ♂—3, ac, 3, 3.
1 ♂—3, 3, 2, 3. 1 ♀—3, 3, 2, 3.
1 ♀—3, 3, ac, 3.
L. cæsar: 1 ♀—3, 2, 2, 3.
L. sylvarum: 1 ♀—3, 3, 3, 3, with two bristles on margin of second abdominal segment (for brevity written 2 ab. br.)

On Aug. 6, at meat at Bussey Institution, were taken:

L. sericata: 68—3, 3, 3, 3. 1 ♂—3, 2, 3, 3.

On Aug. 8, at the garbage scow, Boston, were taken at meat:

L. sericata: 955 individuals—3, 3, 3, 3. 1 ♂ —3, 3, ac, 3.
1 ♂ —3, ac, 3, 3. 1 ♂ —3, 3, 2, 3.
2 ♂♂—3, ab ! c, 3, 3. 1 ♀ —3, *a*bc, 3. 3.
1 ♀ —3, 1, 2, 3. 1 ♀ —3, ac, ac, 3.
1 ♀ —4, 3, 3, 4. 1 ♀ —3, 3, 4, 4.
1 ♀ —3, 4, 3, 3. 1 ♀ —3, 2, 1, 3.
5 ♀♀—3, ac, 3, 3. 2 ♀♀—3, *a*bc, 3, 3.
3 ♀♀—3, 3, ac, 3. 3 ♀♀—3, 3, 2, 3.
4 ♀♀—3, 2, 3, 3.

Flies having the habitus of cæsar were as follows:

5 ♂♂—3, 2, 2, 3. 9 ♀♀—3, 2, 2, 3.
1 ♀ —3, *a*bc, 2, 3.

On Aug. 9 at a short distance from Bussey Institution on leaves near a pond the following were taken:

L. sericata: 1 ♂ —3, 3, 3, 3.
L. cæsar: 1 ♀ —3, 2, 2, 3.
L. sylvarum: 2 ♂♂—3, 3, 3, 3, with 2 ab. br.
1 ♂ —3, 3, 2, 3, with 2 ab. br.
4 ♀♀—3, 3, 3, 3, ab. br. lacking.

On Aug. 10 at same place the following were taken at meat:

L. sericata: 4 ♂♂—3, 3, 3, 3. 100 ♀♀—3, 3, 3, 3.
2 ♀♀—3, 2, 2, 3. 2 ♀♀—3, a / bc, 3, 3.
1 ♀ —3, (*a*), 3, 3, 3.
L. cæsar: 3 ♂♂—3, 2, 2, 3. 20 ♀♀—3, 2, 2, 3.
L. sylvarum: 1 ♂ —3, 3, 3, 3, with 2 ab. br.
1 ♀ —3, 3, 3, 3, with 2 ab. br.
An indeterminate ♂ Lucilia—3, *a*bc, *a*bc, 3.

On Aug. 12, at same place on leaves were taken:

L. sericata: 1 ♀ —3, 3, 3, 3.
L. sylvarum: 14 ♂♂—3, 3, 3, 3, with 2 ab. br.
2 ♂♂—3, 3, 3, 3, with 3 ab. br.
1 ♂ —3, 3, 3, 3, with 4 ab. br.
1 ♂ —3, 3, a / bc, 3, with 2 ab. br.
1 ♀ —3, 3, a / bc, 3, with 2 weak ab. br.

On Aug. 14, at same place, on leaves were taken:

L. sericata: 1 ♀ —3, 3, 3, 3.
L. cæsar: 4 ♀♀—3, 2, 2, 3.
L. sylvarum: 5 ♂♂—3, 3, 3, 3, with 2 ab. br.
1 ♂ —3, 3, 2, 3, with 3 ab. br.
2 ♂♂—3, 3, 3, 3, with 4 ab. br.
1 ♂ —3, a / bc, ab / c, 3, with 2 ab. br.
3 ♀♀—3, 3, 3, 3, ab. br. lacking.

And at meat:

L. cæsar: 2 ♂♂—3, 2, 2, 3.
21 ♀♀—3, 2, 2, 3.
L. sericata: 6 ♂♂—3, 3, 3, 3.
225 ♀♀—3, 3, 3, 3.
1 ♀ —3, 3, 3, / abc.
2 ♀♀—3, a / bc, 3, 3.
1 ♀ —3, 3, a / bc, 3.
1 ♀ —3, ac, 3, 3.
L. sylvarum: 1 ♀ —3, 3, / abc, 3, with 2 weak ab. br.

On Aug. 15, in meadow near Bussey Institution were taken at meat:

L. cæsar: 1 ♂ —3, 2, 2, 3.
L. sericata: 8 ♂♂—3, 3, 3, 3.
145 ♀♀—3, 3, 3, 3.
1 ♀ —3, 3, 3, / abc.
1 ♀ —3, a / bc, 3, 3.
1 ♀ —a / bc, 3, 3, 3.
1 ♀ —3, 3, a / bc, 3.

On Aug. 29, at Hartland, Vt., by the bank of the Connecticut River at some distance from any house were taken at meat:

L. cæsar: 1 ♂ —3, 2, 2, 3. 32 ♀♀—3, 2, 2, 3.
1 ♀ —3, 3, 2, 3.
L. sylvarum: 3 ♀♀—3, 3, 3, 3, with 2 well developed ab. br.

On Oct. 17, at garbage scow, Boston, were taken at meat:

L. sericata: 28 ♂♂—3, 3, 3, 3. 351 ♀♀—3, 3, 3, 3.
1 ♂ —3, 2, 2, 3. 1 ♂ —3, 3, 2, 3.
1 ♀ —3, 2, 2, 3. 1 ♀ —3, 3, 2, 3.
1 ♀ —3, 2, *a*bc, 3. 1 ♀ —3, 3, ac, 3.
1 ♀ —3, ac, ac, 3. 1 ♀ —3, 3, 3, ab / c.
1 ♀ —/ abc, 3, 3, / abc.

In all cases habitus rather than chætotaxy has been taken as the criterion of specific determination, and this I believe to be more reliable on account of my breeding experiments. By habitus I mean general coloration and slight differences of form which would be very hard to define verbally. The width of the front is also important here. The habits are also somewhat different, as may be seen from the observations. *L. sylvarum* appears to be the wildest form, being without excep-

tion taken at some distance from buildings. *Sericata* is more commonly present either inside or very near buildings, while *caesar* may be taken in either situation, but more frequently along with *sylvarum*. It would be of considerable interest to study the distribution of these species over a more extensive area.

In order to get an approximate estimation of the percentage of individuals abnormal in chaetotaxy, I have added the sericatas and find them as follows:

Normal—2,479 individuals. Abnormal by reduction—47 individuals or 2 %. Abnormal by addition—23 individuals or 1%. Abnormal by reduction and addition— 1 ♀—3,2, 2, 4, or .04%.

The variants by reduction are here 10 ♂♂ and 37 ♀♀, while the variants by addition are 2 ♂♂ and 22 ♀♀. The excess of females is of course due to the fact that the flies were taken at meat.

Some of the flies were bred to show the character of the progeny, and these showed results as follows:

L. sylvarum: ♀ —3, 3, a / bc, 3, with 2 very small ab. br., taken by pond near Bussey, Aug. 12, gave all females in progeny as follows:
9 ♀♀—3, 3, 3, 3, ab. br. lacking.
2 ♀♀—3, 3, 3, 3, with 2 small ab. br.
1 ♀ —3, / abc, 3, 3, ab. br. lacking.
3 ♀♀—3, 3, a / bc, 3, ab. br. lacking.
1 ♀ —3, / abc, / abc, 3, ab. br. lacking.
This suggests that an extra post-sutural bristle may be inherited.

L. cæsar:
♀—3, 2, 2, 3, from Bussey Pond, Aug. 14, gave 18 ♂♂—3, 2, 2, 3.
13 ♀♀—3, 2, 2, 3. 1 ♂—3, b, 2, 3.
♀—3, 2, 2, 3, from Bussey Pond, Aug. 10, gave 13 ♀♀—3, 2, 2, 3. No males.

L. sericata:
♀—3,3, 3, 3, from Bussey Institution, July, gave
51 ♂♂—3, 3, 3, 3.
35 ♀♀—3, 3, 3, 3. 1 ♀—3, 3, a / bc, 3.
♀—3, 3, 3, 3, from Bussey Institution, Aug. 5, gave
71 ♂♂—3, 3, 3, 3. 59 ♀♀—3, 3, 3, 3.
3 ♂♂—3, 3, a / bc, 3. 2 ♂♂—3, a / bc, 3, 3.
1 ♂ —3, a / bc, a / bc, 3. 1 ♀ —3, a / bc, 3, 3.
1 ♀ —3, 3, a / bc, 3.
♀—3, 3, 3, 3, from Bussey Institution, July, gave
32 ♂♂—3, 3, 3, 3. 32 ♀♀—3, 3, 3, 3.
3 ♀♀—/ abc, 3, 3, / abc.
1 ♀ —/ abc, / abc, 3, / abc.
1 ♀ —3, / abc, / a / bc, 3.
1 ♀ —/ abc, 3, 3, (*a*), 3.
1 ♀ —3, 3, / abc, 3. 1 ♂ —3, 3, ac, 3.
1 ♂ —/ abc, 3, 3, / abc. 1 ♂ —3, (*c*), 3, 3, 3.
1 ♂ —3, 3, 2, 3. 1 ♂ —3, 3, 3, / abc.

♀—3, 3, 3, 3, from Bussey Institution, July, gave

78 ♂♂—3, 3, 3, 3.	110 ♀♀—3, 3, 3, 3.
1 ♂ —3, 3, ab, 3.	1 ♂ —3, 2, ac, 3.
4 ♂♂—3, 2, 3, 3.	1 ♂ —3, 2, 2, 3.
1 ♂ —3, (*a*), 3, 3, 3.	1 ♂ —3, a / bc, a / bc, 3.
1 ♀ —3, 3, ac, 3.	1 ♀ —3, 3, 3, / abc.
1 ♀ —/ abc, 3, 3, / abc.	1 ♀ —/ abc, 3, 3, 3.
1 ♀ —3, a / bc, 3, 3.	

♀—3, 3, 3, 3, from Bussey, July, gave:*

30 ♂♂—3, 3, 3, 3.	34 ♀♀—3, 3, 3, 3.
1 ♂ —3, ac, 3, 3.	

2 ♀♀—3, 3, 3, 3, taken at Bussey Institution, gave:

191 ♂♂—3, 3, 3, 3.	203 ♀♀—3, 3, 3, 3.
2 ♂♂—3, ac, 3, 3.	3 ♂♂—3, 2, 3, 3.
2 ♂♂—3, 3, 2, 3.	1 ♂ —3, ab, 3, 3.
1 ♂ —3, 3, ac, 3.	1 ♀ —3, 2, 2, 3.
1 ♂ —3, ac, 2, 3.	

1 ♀—3, 3, 3, 3, from Bussey Institution, Nov. 20, gave:

124 ♂♂—3, 3, 3, 3.	118 ♀♀—3, 3, 3, 3.
1 ♀ —3, 3, 2, 3.	1 ♂—3, 2, 3, 3.
1 ♂ —3, ac, 3, 3.	

1 ♀ —3, 3, 3, 3, from Bussey Institution, Nov. 18, gave:

25 ♂♂—3, 3, 3, 3.	34 ♀♀—3, 3, 3, 3.
2 ♀♀—3, 3, ac, 3.	1 ♀—3, ac, 3, 3.
1 ♀ —3, a / bc, 3, 3.	1 ♂ —a / bc, 3, 3, 3.

1 ♀—3, 3, 3, 3, from scow, Boston, Aug. 8, gave:

17 ♂♂—3, 3, 3, 3.	19 ♀♀—3, 3, 3, 3.
1 ♀ —3, 3, a / bc, 3.	

Thus the progeny of normal ♀ ♀ (3, 3, 3, 3.) show considerable variation, and it is readily observed that this variation tends in some cases to reduction of bristles, in other cases to addition of bristles, while both tendencies may be observed in the same family. Taking the totals of these families we have normal ♂ ♂ 589, normal ♀ ♀ 410, variants by addition, 12 ♂ ♂ and 16 ♀ ♀; and variants by reduction, 21 ♂ ♂ and 6 ♀ ♀. This gives 2.6% variants by addition and 2.5% variants by reduction.

Let us now consider the families of *L. sericata* produced by mothers abnormal by reduction.

♂ and ♀—3, 3, 2, 3, taken at scow, Boston, Oct. 17, put in same box, gave:

13 ♂♂—3, 3, 3, 3.	8 ♀♀—3, 3, 3. 3.
1 ♂ —3, 3, 2, 3.	1 ♂ —3, ac, 3, 3.
1 ♂ —3, ac, ac, 3.	1 ♂ —3, 3, 2, 3.
2 ♀♀—3, 2, 3, 3.	

♀—3, 2, 3, 3, taken at scow, Boston, Aug. 8, gave:

32 ♂♂—3, 3, 3, 3.	22 ♀♀—3, 3, 3, 3.
1 ♂ —3, ac, 3, 3.	1 ♂ —3, 3, ac, 3.
1 ♂ —3, 3, ab, 3.	1 ♂ —3, 2, 3, 3.
1 ♂ —3, ac, 2, 3.	

*By reason of an imperfection in the technique at this point, this culture may have been contaminated from flies outside. The results are therefore, not averaged in with the total.

♀—3, 3, ac, 3, from scow, Boston, Aug. 8, gave 12 ♂♂—3, 3, 3, 3.
15 ♀♀—3, 3, 3, 3.
♀—3, ac, 2, 3, from Bussey Institution, July, gave:
18 ♂♂—3, 3, 3, 3. 8 ♀♀—3, 3, 3, 3.
♀—3, 2, 3, 3, from scow, Boston, Aug. 8, gave:
10 ♂♂—3, 3, 3, 3. 14 ♀♀—3, 3, 3, 3.
1 ♂ —3, 3, 2, 3. 1 ♂ —3, ac, 3, 3.
1 ♀ —3, ac, ac, 3.
♀—3, 2, 1, 3, from scow, Boston, Aug. 8, gave 10 ♂♂—3, 3, 3, 3. 12♀♀—3, 3, 3, 3. This family was continued into the third generation and will be considered below.
♀—3, ac, 3, 3, from scow, Boston, Aug. 8, gave:
7 ♂♂—3, 3, 3, 3. 7 ♀♀—3, 3, 3, 3.
1 ♀ —3, 3, a / bc, 3.

Taking the totals of these families of females deficient in bristles we find normal ♂♂102, normal ♀♀ 86, variants by reduction 10 ♂♂ and 4 ♀♀, variants by addition, 1 ♀. Thus from these rather small numbers we see the variants by reduction are 7%, while the variants by addition are 0.5%.

Let us consider now the progeny of females abnormal by addition of bristles.

♀—/ abc, 3, 3, / abc, from scow, Boston, Oct. 17, gave:
30 ♂♂—3, 3, 3, 3. 21 ♀♀—3, 3, 3, 3.
1 ♂ —3, (*a*), 3, 3, (*a*), 3.
♀—3, 3, 3, ab ! c, from scow, Boston, Oct. 17, gave:
9 ♂♂—3, 3, 3, 3. 20 ♀♀—3, 3, 3, 3.
1 ♂ —3, 3, 3, (*a*), 3. 1 ♂ —3, ac, 3, 3.
1 ♀ —3, ac, ac, 3.
♀—3, 3, a / bc, / abc, from scow, Boston, Aug. 8, gave:
40 ♂♂—3, 3, 3, 3. 32 ♀♀—3, 3, 3, 3.
3 ♂♂—3 a ! bc, 3, 3. 1 ♂—3, 3, a ! bc, 3.
1 ♂—3, (a), 3, 3, 3. 1 ♂ —3, ac, ac, 3.
1 ♀ —3, 3, a / b / c, 3. 2 ♀♀—3, a ! bc, 3, 3.
1 ♀ —3, 3, ac, 3. 1 ♀ —3, ab, 3, 3.
1 ♀ —3, 3, 2, 3. 1 ♀ —3, ac, 3, 3.
♀—a / bc, a / bc, 3, 3, from scow, Boston, Aug. 8, gave:
75 ♂♂—3, 3, 3, 3. 52 ♀♀—3, 3, 3, 3.
1 ♂ —3, 3, a / bc, 3. 1 ♂ —3 (*a*), 3, 3, 3.
1 ♂ —3, a / bc, 3, 3. 2 ♀♀—3, a / bc, 3, 3.
2 ♀♀—3, 3, a / bc, 3. 1 ♀ —3, 3, 3, a / bc.

Taking the totals of these families of females abnormal by addition of bristles we find normal ♂♂ 154, normal ♀♀ 125, variants by reduction, 2 ♂♂ and 5 ♀♀; variants by addition, 10 ♂♂ and 8 ♀♀. Thus the variants by reduction are 2.3% while the variants by addition are 6%.

From the averages of the reared stock we see there is a tendency to vary both toward reduction and toward addition of bristles and that this tendency is evidently of a hereditary character, the mean being shifted in the direction of the parental abnormality.

The female of *L. sericata* (3, 2, 1, 3.) taken at the garbage scow, Boston, August 8, gave as above recorded 10 ♂ ♂–3, 3, 3, 3, and 12 ♀ ♀–3, 3, 3, 3. Three pairs of these were segregated and gave offspring as follows:

1st pair gave:	
10 ♂ ♂—3, 3, 3, 3.	7 ♀ ♀—3, 3, 3, 3.
2d pair gave:	
42 ♂ ♂—3, 3, 3, 3.	39 ♀ ♀—3, 3, 3, 3.
1 ♂ —ac, 3, 3, ac.	2 ♂ ♂—3, ! abc, 3, 3.
1 ♂ —3, 2, 3, 3.	1 ♀ —3, ac, ac, 3.
1 ♀ —3, ac, 3, 3.	
3d pair gave:	
55 ♂ ♂—3, 3, 3, 3.	62 ♀ ♀—3, 3, 3, 3.
7 ♂ ♂—3, 2, 2, 3.	1 ♀ —3, 2, 2, 3.
2 ♂ ♂—3, 3, 2, 3.	3 ♀ ♀—3, 2, 3, 3.
1 ♂ —3, 3, 3, ac.	1 ♀ —3, *a*bc, 3. 3.
1 ♂ —3, a ! bc, 3, 3.	1 ♀ —3, *a*bc, 2, 3.
1 ♀ —2, 3, 3, 3.	1 ♀ —3, 3, ac, 3.
1 ♀ —3, ab, 3, 3.	

Of the progeny of the first pair 1 ♂–3, 3, 3, 3, was mated to 2 ♀ ♀–3, 3, 3, 3, and produced offspring as follows:

163 ♂ ♂—3, 3, 3, 3.	170 ♀ ♀—3, 3, 3, 3.
2 ♂ ♂—3, ac, 3, 3.	2 ♀ ♀—3, ac, 3, 3
2 ♂ ♂—3, 3, ac, 3.	1 ♀ —2, 3, 3, 3.
1 ♂ —3, 3, 2, 3.	1 ♀ —ac, 3, 3, 2.
1 ♂ —With very few scattered bristles.	1 ♀ —ac, 3, 2, 0.
	1 ♀ —ab, 3, ab, *b*c.
1 ♂ —3, a ! bc, 3, 3.	2 ♀ ♀—3, a ! bc, 3, 3.
1 ♂ —3, 3, a ! bc, 3.	2 ♀ ♀—3, 3, a ! bc, 3.
1 ♀ —3, 3, a ! bc, 3.	1 ♀ —*!* abc, 3, 3, *!* abc.
1 ♀ —a ! bc, 3, 3, 3.	

Of the progeny of the second pair 1 ♂–3, 3, 3, 3, was mated to 1 ♀–3, 3, 3, 3, and produced the following:

92 ♂ ♂—3, 3, 3, 3.	85 ♀ ♀—3, 3, 3, 3.
2 ♂ ♂—3, a! bc, a ! bc, 3.	5 ♂ ♂—3, a ! bc, 3, 3.
4 ♂ ♂—3, 3, a ! bc, 3.	3 ♀ ♀—3, a ! bc, 3, 3.
1 ♀ —3, 3, a *!* bc, 3.	1 ♀ —3, ac, 3, 3.

If we take the totals of this inbred stock we find them as follows:

362 ♂ ♂—3, 3, 3, 3.	363 ♀ ♀—3, 3, 3, 3.

By reduction, 18 ♂ ♂ and 18 ♀ ♀ or 5%.
By addition, 16 ♂ ♂ and 11 ♀ ♀ or 3.7%.

In the spring of 1912 a few specimens of *Calliphora vomitoria L.* and *C. viridescens* Desv. were taken at Cambridge and *C. erythrocephala* Meig was common all through the summer. In the fall *vomitoria* and *viridescens* appeared in considerable numbers in the vicinity of the Bussey Institution. The

records of chaetotaxy of the wild *Calliphorae* that was taken at Bussey are as follows. The bristles observed are the post-achrosticals and post-dorso-centrals as in *Lucilia.*

C. erythrocephala:

33 ♂♂—3, 3, 3, 3.	134 ♀♀—3, 3, 3, 3.
1 ♀ —3, 3, a ! bc, 3.	1 ♀ —2, 3, 3, 3.

C. vomitoria:

2 ♂♂—3, 3, 3, 3.	54 ♀♀—3, 3, 3, 3.

C. viridescens:

21 ♀♀—3, 3, 3, 3.	1 ♀ —3, ab, 3, 3.

These records show 3 abnormals out of 247, but the ratio is not very significant as the numbers are very small.

The records of breeding *Calliphorae* show rather interesting results.

A ♀ *erythrocephala*—3, 3, 3, 3, gave:

54 ♂♂—3, 3, 3, 3.	47 ♀♀—3, 3, 3, 3.
2 ♂♂—3, a ! bc, 3, 3.	

One of these abnormal males was mated to his sister and the pair gave the following offspring:

131 ♂♂—3. 3, 3, 3.	86 ♀♀—3, 3, 3, 3.
1 ♂ —3, (*a*), 3, 3, 3.	1 ♀ —3, a ! bc, aabc, 3.
4 ♂♂—3, a ! bc, 3, 3.	5 ♀♀—3, 3, a ! bc. 3.
1 ♂ —3, a ! bc, a ! bc, 3.	1 ♀ —3, 3, 3, ab.
8 ♂♂—3, 3, a ! bc, 3.	
1 ♂ —3, ab, 3, 3.	

Another wild ♀ *erythrocephala*—3, 3, 3, 3, gave:

80 ♂♂—3, 3, 3, 3.	74 ♀♀—3, 3, 3, 3.

Another wild ♀ *erythrocephala*—3, 3, 3, 3, gave:

97 ♂♂—3, 3, 3, 3.	97 ♀♀—3, 3, 3, 3.
	2 ♀♀—3, 3, ac, 3.

A ♀ *vomitoria*—3, 3, 3, 3, gave:

47 ♂♂—3, 3, 3, 3.	64 ♀♀—3, 3, 3, 3.
4 ♂♂—3, ac, 3, 3.	4 ♀♀—3, ac, 3, 3.
2 ♂♂—3, 3, ac, 3.	4 ♀♀—3, 3, ac, 3.
1 ♂ —3, 3, ab, 3.	1 ♀ —3, 2, 3, 3.
1 ♂ —3, 3, 2, 3.	

Another ♀ *vomitoria*—3, 3, 3, 3, gave:

32 ♂♂—3, 3, 3, 3.	64 ♀♀—3, 3, 3, 3.
1 ♂ —ab, 3, 3, 3,	2 ♂♂—3, a ! bc, 3. 3.
1 ♂ —3, 2, 3, 3.	1 ♀—3, / abc, / abc, 3.
1 ♂ —3, 2, 2, 3.	

A ♀ *viridescens*—3, 3, 3, 3, gave:

5 ♂♂—3, 3, 3, 3.	5 ♀♀—3, 3, 3, 3.
1 ♂ —3, 2, 3, 3.	1 ♀ —3, ac, 3, 3.

Another ♀ *viridescens*—3, ab, 3, 3, gave:

4 ♂♂—3, 3, 3, 3.	6 ♀♀—3, 3, 3, 3.
1 ♂ —3, ac, ac, 3.	

The totals of the bred stock for the three species are:

450 ♂♂—3, 3, 3, 3.	443 ♀♀—3, 3, 3, 3.

By reduction 14 ♂♂ and 4 ♀♀, or 2%; by addition 18 ♂♂ and 12 ♀♀ or 3%.

In the course of collecting Calliphoræ four specimens were obtained which I was unable to classify as belonging to any one of the three species common in Massachusetts. They appeared like inter-grades between *erythrocephala* and *viridescens*.

One small sized male had the beard black, the right cheek dark red, and the left cheek somewhat lighter in color. The right cheek was dark enough to place the specimen as viridescens but the left cheek resembled that of erythrocephala. One small and two large sized females answer also to the same description. In all four cases the right cheek is considerably darker then the left. The flies were examined by Mr. C. W. Johnson who was unable to classify them.

The meaning of these forms is uncertain and I should not feel justified in advancing an hypothesis without first performing breeding experiments with them.

SUMMARY AND CONCLUSIONS.

A number of meat flies of the Calliphorine genera, *Lucilia* and *Calliphora*, were collected during the summer and fall of 1912 and observations were made on the range of variation in the chaetotaxy. The bristles studied were the post-sutural achrosticals and dorso-centrals of the thorax. Breeding experiments were also performed in order to study the range of variation in the individual families.

Especial attention was given to *Lucilia sericata*. The following table gives the general results of the work on this species.

	Normal		Abnormal by reduct'n			Abnormal by addition		
Wild Flies Captured	2,479		Number 47		Percentage 2	Number 23		Percentage 1
	♂♂	♀♀	♂♂	♀♀		♂♂	♀♀	
Progeny of normal ♀♀	589	410	21	6	2.5	12	16	2.6
Progeny of ♀♀ abnormal by reduction	102	86	10	4	7	0	1	0.5
Progeny of ♀♀ abnormal by addition	154	125	2	5	2.3	10	8	6

As regards the wild flies captured it will be observed that there are twice as many abnormal by reduction as there are abnormal by addition. Too much importance should not be attached to this fact, as it may be due to an error. In a few cases there is reduction in the size of the bristle normally present, but as a general thing there is no reduction unless the bristle is entirely absent. On the other hand a very small bristle is frequently added and it is more rarely the case that a supernumerary bristle is of the full size. In looking over a large number of flies rapidly, one would then have a tendency to overlook the presence of the small additional bristle and to record more reduction than addition in number. As these flies were examined for the purpose of finding breeding material, careful attention was not given to this matter and I am inclined to consider the normal range of variation to be somewhat above two per cent both in the direction of reduction and in the direction of addition. This equality of variation in both directions is seen in the progeny of normal females. In the progeny of females abnormal by reduction and of females abnormal by addition, the variation of the offspring is seen to tend in the direction of the parental abnormality.

A single female lacking three bristles, (3, 2, 1, 3), gave ten males and twelve females of normal chaetotaxy. Three pairs of these gave 215 normal flies, 23 abnormal by reduction, and 3 abnormal by addition. A pair and a trio of these normals gave in the third generation from the original female, 510 normals, 13 abnormal by reduction, and 24 abnormal by addition. This shows regression away from the abnormal and suggests Galton's Law.

Observations made on *Lucilia sylvarum* and *caesar*, and on *Calliphora erythrocephala*, *viridescens*, and *vomitoria* lead me to believe that these five species are analogous to *Lucilia sericata* in the variation of their chaetotaxy.

In conclusion I wish to express my thanks for suggestions and criticism in the course of the work kindly offered by Professor Wheeler, Professor Castle and Mr. Brues.